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ABSTRACT

This report presents data compiled as part of a comprehensive program to measure and analyze the nation's resources expended for research and development (R&D). R&D spending in the United States is expected to reach $51 billion in 1979, 9% over the 1978 level. The R&D expenditures are expected to account for 2.2% of the gross national product (GNP) in 1979. Other figures in this report show that the federal government is expected to furnish $25.8 billion on R&D programs in 1979 with most of the increase planned for areas of energy and health. Non-federal R&D support is also expected to increase by 9% over the 1978 level, to $25.2 billion in 1979. Industry will provide over 90% of the funds. Basic and applied research spending are expected to amount to $6.4 billion and $12 billion respectively in 1979, nearly 10% more for each area than in 1978. Tabulated data present funds by performer and funds by source for years 1974 through 1979. The data given exclude university and college department research. (HM)

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National R&D Spending to Exceed $50 Billion in 1979

Assessment Highlights

- Although knowledge is limited regarding the relationship between R&D and economic growth and productivity, it is generally accepted that the relationship is positive and significant. It should be of national concern, therefore, that the doubling of the Nation's R&D expenditures since 1969 has been almost entirely attributable to inflation. However, real growth has been experienced in the overall U.S. R&D effort each year since 1975. This growth has resulted in large part from increased emphasis on finding alternative sources of energy and is not seen as providing a major stimulus to economic growth or productivity in the short term.

- Over the last decade, the Federal Government, which currently supports more than one-half of the Nation's R&D effort, has increased its emphasis on civilian programs relative to that for defense and space. For 1978 and 1979 the largest Federal R&D spending increases are expected to be in the energy and health areas. Within the civilian area, beginning in 1979, greater emphasis is planned for research of a long-term nature in contrast to earlier years in which such emphasis was placed on large-scale demonstration projects.

- During the seventies there has been a general trend of allocating proportionately less of the national R&D effort each year to basic research. The following are the three main factors behind this trend:

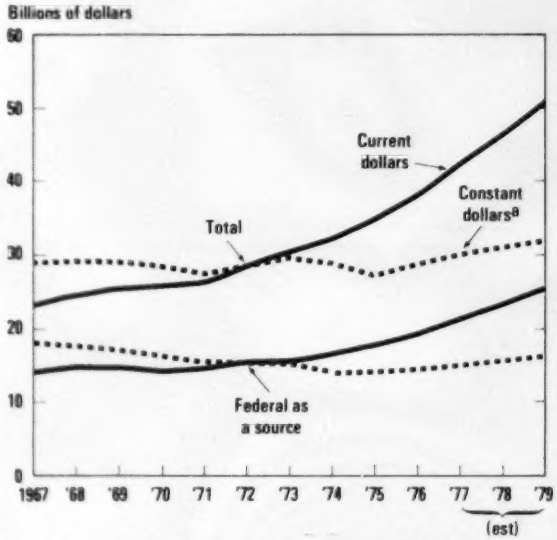
  (1) The Federal Government deemphasized basic research within its defense and space programs during the early to midseventies. However, recent administrations have adopted a policy of strengthening basic research. This policy has shown signs of reversing this trend in 1978 and 1979.

  (2) Throughout the seventies, the industrial sector has been increasingly emphasizing shorter term payoffs from its R&D effort. As pointed out in a number of interviews with industrial R&D officials, this has resulted in industry devoting more of its research effort to projects with a specific product or process in mind over projects with no specific commercial application. This trend is expected to continue.

  (3) Universities devote most of their non-Federal R&D funds to basic research. However, they have increasingly been emphasizing applied research work with these funds since 1970. Since a large portion of these non-Federal funds represent cost-sharing activities on Federal grants, the recent Federal emphasis on basic research should result in a reversal of this applied research trend starting in 1978.

- With the constant-dollar increases in R&D spending since 1975, the employment of R&D professionals has also risen. More R&D scientists and engineers were employed in 1977 in the United States than in any previous year. The increased emphasis on energy R&D efforts should result in continual increases in R&D professional employment into the near future with the largest gains being in industry.

National R&D expenditures: 1967-79



[a]Based on GNP implicit price deflator. Assumes a 6-percent increase in this deflator between 1977 and 1978 and between 1978 and 1979.

SOURCE: National Science Foundation

Prepared in the R&D Economic Studies Section, Division of Science Resources Studies.

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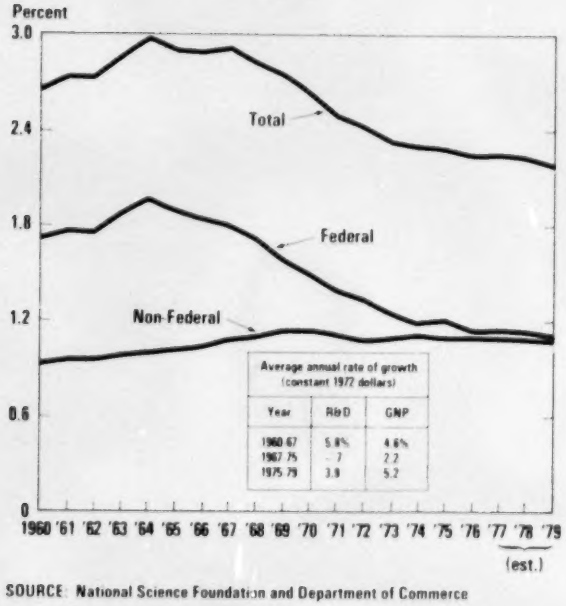
Data Highlights

- Total R&D spending in the United States is expected to reach $51 billion in 1979, an increase of 9 percent over the 1978 level of $47 billion and double the amount spent on these activities a decade earlier. In constant dollars, national R&D funds should increase 2 percent in 1979 after a 4-percent gain in 1978, extending the period of real growth to four successive years.
- National R&D expenditures are expected to account for 2.2 percent of the gross national product (GNP) in 1979, the same as in 1978 and down slightly from 2.3 percent in 1977. This ratio has been declining steadily each year from its 1964 high of 3.0 percent, primarily as a result of the slowdown in Federal R&D spending through the midseventies. With the expected increases in the Federal R&D effort into the eighties, this ratio should remain at about its present level into the near future.
- Basic and applied research spending are expected to amount to $6.4 billion and $12.0 billion, respectively, in 1979—nearly 10 percent more for each than in 1978 when $5.9 billion and $11.0 billion, respectively, were spent on these activities. Development spending is expected to increase by some 8 percent between 1978 and 1979 from $30.2 billion to $32.6 billion. In constant dollars, basic research is expected to increase 5 percent in 1978 and 3 percent in 1979; applied research should increase 3 percent each year; development should grow 4 percent and 2 percent, respectively.

R&D/GNP: 1960-79



SOURCE: National Science Foundation and Department of Commerce

- In 1977 an estimated 566,000 R&D scientists and engineers were employed in the United States, 3 percent more than in 1976. It is expected that R&D professional employment will approach 600,000 by the end of the decade.

R&D Support

Overall R&D spending continued its pattern of current-dollar increases in both 1978 and 1979 with Federal and non-Federal support expected to register significant growth in both years.

The Federal Government is expected to furnish $25.8 billion for research and development in 1979—8 percent more than in 1978 when such support reached $23.8 billion. These funds will account for slightly more than one-half of the Nation's overall R&D effort in both 1978 and 1979. In contrast, in 1969 the Government supplied nearly 60 percent of the Nation's R&D support. The drop in the Federal share was caused by cutbacks in defense and space programs beginning in the late sixties. Since 1975, however, Federal R&D spending levels have been increasing, promoted in large part by the growing national emphasis on energy. Starting in 1980, however, Federal R&D increases are expected to shift back toward defense and space activities. This is based on data shown in "Special Analysis P" of the *U.S. Budget*.

Non-Federal R&D support is expected to rise 9 percent in 1979 to $25.2 billion after increasing 11 percent in 1978 to $23.2 billion. Over 90 percent of the non-Federal R&D funds will be provided by industry each year. Industrial R&D growth has been stimulated in the recent past by energy and environmental concerns as shown in the annual industrial R&D survey. As a result of these concerns, particularly those dealing with energy, additional increases are expected in constant-dollar R&D spending by non-Federal sources, primarily industry, at least through the mideighties.

Basic Research Support

In 1979 national basic research spending is expected to reach $6.4 billion, 9 percent above the 1978 level of $5.9 billion. Throughout the seventies, however, basic research as a percent of total R&D spending has decreased from 14 percent in 1970 to 12 percent in 1977. This drop in the ratio has been a matter of national concern, particularly on the part of the Government which supports almost 70 percent of the Nation's basic research effort. This ratio, however, has increased since 1977 to a 1979 figure of 13 percent, mostly as a result of recent administrations' policy of strengthening basic research. This policy should also increase the ratio of university R&D expenditures for basic research in 1978 since a large portion of these funds represent cost-sharing arrangements on Federal grants.

Funds for research and development: 1974-79

(Millions of dollars)

Year	Total	Government	Industry[1]	Universities and colleges	Associated FFRDC's[2]	Other nonprofit institutions[1]
			By performer			
1974	$32,677	$4,815	$22,816	$3,017	$865	$1,164
1975	35,128	5,397	24,096	3,405	987	1,243
1976	38,522	5,710	26,618	3,724	1,147	1,323
1977 (est)	42,702	6,465	29,400	4,045	1,375	1,417
1978 (est)	47,000	6,555	32,800	4,570	1,555	1,520
1979 (est)	51,000	7,000	35,900	4,950	1,600	1,550
			By source			
1974	$32,677	$16,733	$14,824	$671	—	$449
1975	35,128	18,127	15,747	743	—	511
1976	38,522	19,478	17,666	815	—	563
1977 (est)	42,702	21,797	19,408	886	—	611
1978 (est)	47,000	23,835	21,475	1,000	—	690
1979 (est)	51,000	25,750	23,400	1,100	—	750

[1] Expenditures for federally funded research and development centers (FFRDC's) administered by both industry and by nonprofit institutions are included in the totals of their respective sectors.

[2] FFRDC's administered by individual universities and colleges and by university consortia.

Source: National Science Foundation

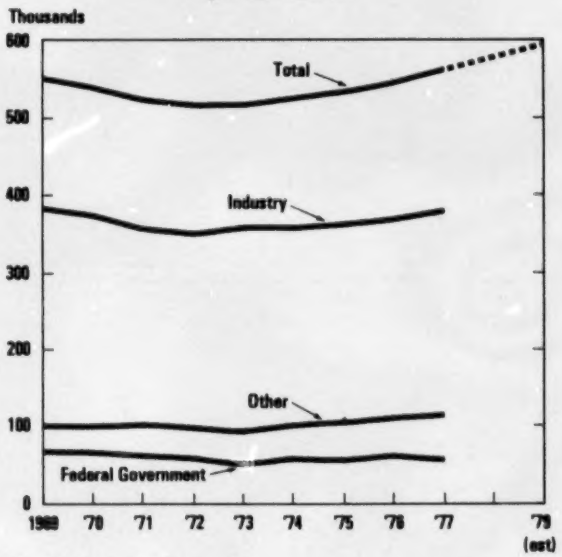
R&D Scientists and Engineers

In 1977, 566,000 full-time-equivalent (FTE) scientists and engineers were employed in R&D activities in all sectors of the economy, 3 percent more than were employed in these activities a year earlier. In fact, the employment of R&D professionals has been increasing every year since 1972 when 519,000 were employed. With the increases expected in constant-dollar R&D spending in 1978 and 1979, the employment of R&D scientists and engineers should approach 600,000 by the end of the decade. The industry sector which employs nearly 70 percent of these professionals will account for the bulk of the increase with heavy emphasis on engineering skills.

* * * * * *

These data were compiled from information on R&D activities collected through individual sector surveys conducted as part of a comprehensive program to measure and analyze the Nation's resources expended for research and development. Details on R&D expenditures and manpower will be published in a report entitled *National Patterns of R&D Resources: Funds and Manpower in the United States, 1953 to 1978-79* to be available in the summer of 1978 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Full-time-equivalent R&D scientists and engineers by sector: 1969-79



SOURCE: National Science Foundation